



# *Function Points in Brazil*

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# Agenda

- Introduction
  - **Brazil in the Function Point World**
- History
  - **The First Wave**
  - **The Second Wave**
- Function Points in Estimation
  - **The Productivity Model**
  - **The COCOMO II Model**
- Function Points in Contracts
  - **A Maturity Model (One More!)**
  - **The Productivity Approach**
  - **The Price per FP Approach**
  - **Scope Management**
  - **Cases**

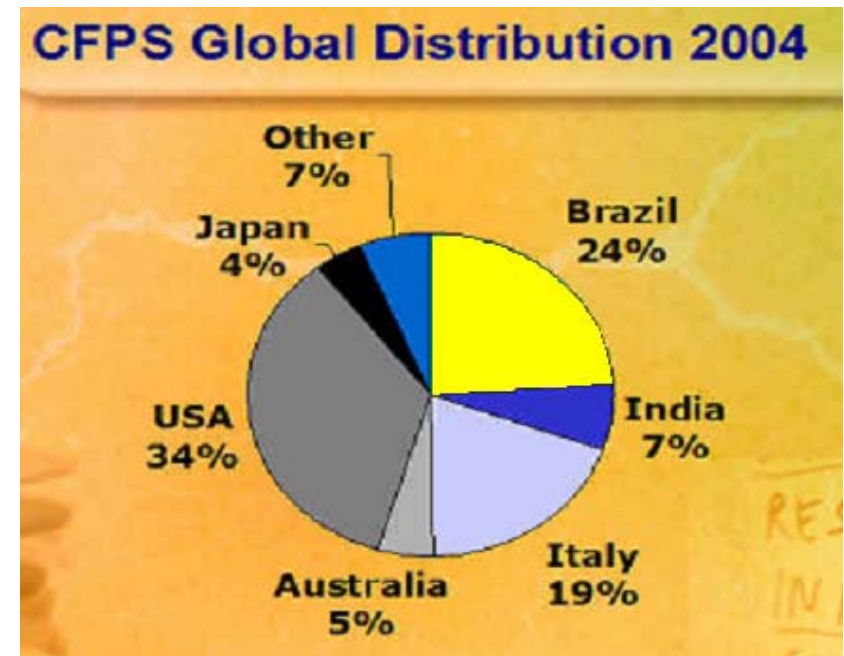


# *Introduction*



# Introduction




## Brazil - Number 2 in the FP World





# Introduction

## Brazilian CFPS Exam Sites

	<b>BFPUG (Rio)</b>
 	<b>CFPS Exams</b>





# *History*



## The First Wave

- 1983 - First FPA course in Brazil (UNISYS)
- 1991 - First Brazilian FPA User Conference
- 1992-1996 - 7 more user conferences
- 1996 - First CFPS exam in Brazil (3 CFPS)





## The Second Wave

- BFPUG founded in 1998
- CFPS exams in 2001, 2002, 2003, and 2004
- Number of CFPS approaches 200







# *Function Points in Estimation*



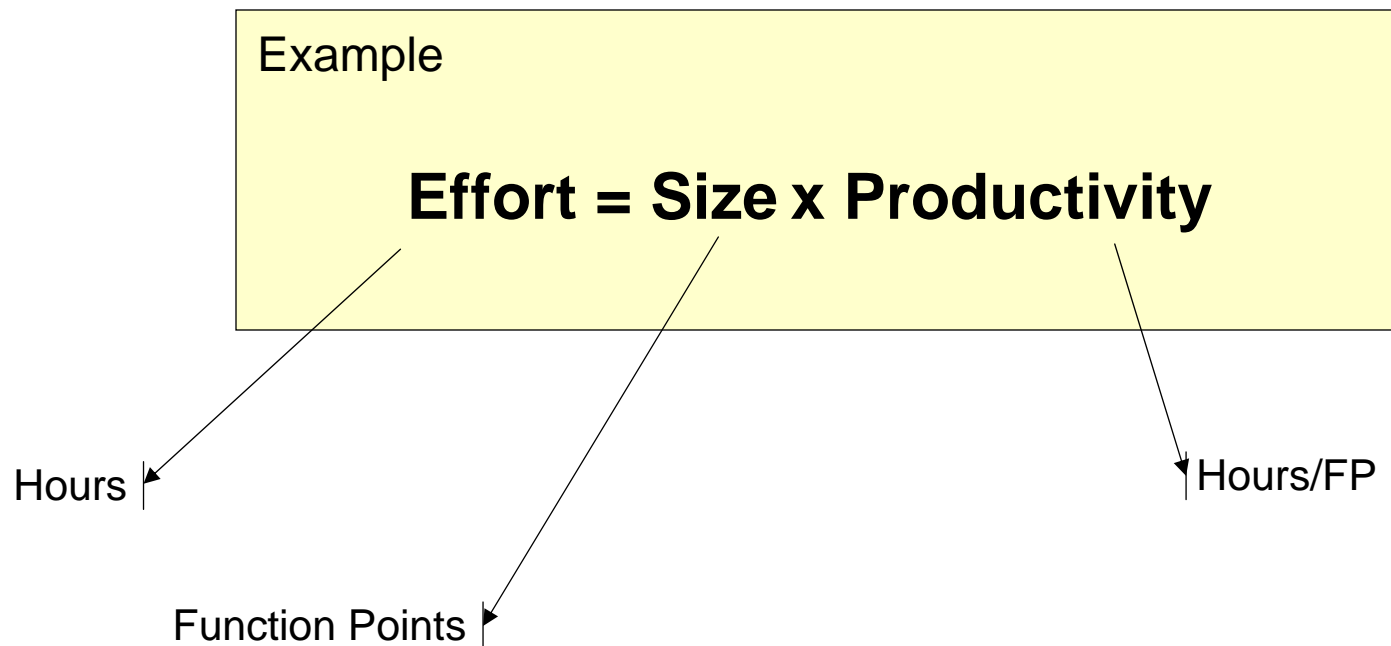
# The Productivity Model

- Simple relationships based on local historical data
- Should be used to simplify the process and not because of a lack of knowledge
- Assumes that performance factors do not change among past and future projects
- Assumes constant, linear relationships



# The Productivity Model

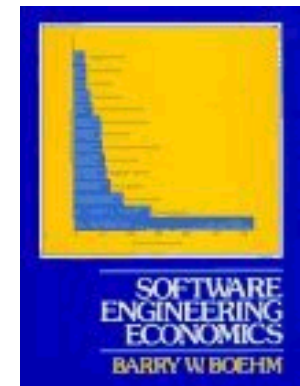
- Not applicable outside of the organization and domain that provided the data





## The COCOMO II Model

- COCOMO II has 22 parameters (5 exponential and 17 linear) that may be adjusted according to the characteristics of a particular project.
- COCOMO was originally created by Barry Boehm in 1981.
- The current version, COCOMO II, was released in 2000.





# The COCOMO II Model

- Over 2,000 candidate projects were filtered to get the **161** projects used to calibrate COCOMO II.
- Before being used, COCOMO II should be locally calibrated to the organization's historical data.
- The USC free software tool may be used to locally calibrate COCOMO II
- An alternative free calibration tool is CALICO from SoftStar Systems.





## The COCOMO II Model

### Government Bank - 6 projects

- A Brazilian bank needed to estimate effort and schedule for a 1400 PF project.
- 6 similar completed projects were identified.
- All projects used Java technology.
- COCOMO II was calibrated to the 6 projects.
- The free CALICO tool was used in the calibration. (<http://www.softstarsystems.com>)



# The COCOMO II Model

## Government Bank - 6 projects

**Calibration Results**

Equation

Effort Equation     Schedule Equation

$0.5981 + 1.00 \wedge \text{SFs} / 100$

Effort = EAF  $\wedge$  126.0558  $\wedge$  (KSLOC)

Copy Equation to Current Model

Histories Used: 6  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.99	PRED(.10):	67 %
Standard Error:	9	PRED(.15):	83 %
Sum( (actual - estimate) <sup>2</sup> ):	316	PRED(.20):	83 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	0.08460	PRED(.25):	100 %
Mean Random Error:	0.09	PRED(.30):	100 %

Show Details    Close

83% of projects had error  $\leq$  20%

100% of projects had error  $\leq$  25%



# The COCOMO II Model

## Government Bank - 6 projects

**Calibration Results**

Equation

Effort Equation       Schedule Equation

$0.2872 + 0.20 \wedge \text{SFs} / 100$

Schedule =  $3.6899 \wedge (\text{Effort})$

**Copy Equation to Current Model**

Histories Used: 6  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.87	PRED(.10):	67 %
Standard Error:	2	PRED(.15):	67 %
Sum( (actual - estimate) <sup>2</sup> ):	21	PRED(.20):	83 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	0.14275	PRED(.25):	83 %
Mean Random Error:	0.13	PRED(.30):	83 %

**Show Details**      **Close**





# The COCOMO II Model

## Government Service Organization - 16 projects

- The organization needed an estimation process.
- Web projects were a priority.
- All projects used Cold Fusion technology.
- 16 similar completed projects were identified.
- COCOMO II was calibrated to the 16 projects.
- The free CALICO tool was used in the calibration. (<http://www.softstarsystems.com>)



# The COCOMO II Model

## Government Service Organization - 16 projects

**Calibration Results**

Equation

Effort Equation     Schedule Equation

$0.5439 + 1.00 \wedge SFs / 100$

Effort = EAF  $\wedge$  2.1018  $\wedge$  (KSLOC)

Copy Equation to Current Model

Histories Used: 16  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.45	PRED(.10):	25 %
Standard Error:	3	PRED(.15):	44 %
Sum( (actual - estimate) <sup>2</sup> ):	138	PRED(.20):	50 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	2.05388	PRED(.25):	56 %
Mean Random Error:	0.30	PRED(.30):	56 %

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# The COCOMO II Model

## Government Service Organization - 16 projects

**Calibration Results**

Equation

Effort Equation     Schedule Equation

$0.5962 + 0.20 \wedge \text{SFs} / 100$

Schedule =  $1.4776 \wedge (\text{Effort})$

Copy Equation to Current Model

Histories Used: 16  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.64	PRED(.10):	38 %
Standard Error:	1	PRED(.15):	50 %
Sum( (actual - estimate) <sup>2</sup> ):	20	PRED(.20):	69 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	0.58166	PRED(.25):	81 %
Mean Random Error:	0.16	PRED(.30):	94 %

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# The COCOMO II Model

## Global Electronics Manufacturer - 6 projects

- The organization needed an estimation process.
- All projects used VB or ASP technology.
- All projects were very short - 2 to 4 months.
- 6 similar completed projects were available.
- COCOMO II was calibrated to the 6 projects.
- The free CALICO tool was used in the calibration. (<http://www.softstarsystems.com>)



# The COCOMO II Model

## Global Electronics Manufacturer - 6 projects

**Calibration Results**

Equation

Effort Equation     Schedule Equation

$0.0886 + 1.00 \wedge \text{SFs} / 100$

Effort = EAF  $\wedge$  30.8814  $\wedge$  (KSLOC)

Copy Equation to Current Model

Histories Used: 6  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.60	PRED(.10):	33 %
Standard Error:	2	PRED(.15):	50 %
Sum( (actual - estimate) <sup>2</sup> ):	22	PRED(.20):	50 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	0.32982	PRED(.25):	67 %
Mean Random Error:	0.18	PRED(.30):	83 %

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# The COCOMO II Model

## Global Electronics Manufacturer - 6 projects

**Calibration Results**

Equation

Effort Equation     Schedule Equation

$0.4561 + 0.20 \wedge \text{SFs} / 100$

Schedule =  $0.9938 \wedge (\text{Effort})$

Copy Equation to Current Model

Histories Used: 6  
Mode: n/a  
Constant from: Constant & Exponent Calibration  
Exponent from: Constant & Exponent Calibration

r-squared:	0.71	PRED(.10):	67 %
Standard Error:	0	PRED(.15):	67 %
Sum( (actual - estimate) <sup>2</sup> ):	1	PRED(.20):	83 %
Sum( (ln(act) - ln(est)) <sup>2</sup> ):	0.08216	PRED(.25):	100 %
Mean Random Error:	0.09	PRED(.30):	100 %

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# The COCOMO II Model Summary

- All 3 organizations CMM L1
- Mean Error varied widely among organizations
- Variation may be reduced through software process standardization

Organization	N	Effort MRE	Sch MRE	Effort PRED(.30)	Sch PRED(.30)
Gov Bank	6	9%	13%	100%	83%
Gov Serv	16	30%	16%	56%	94%
Glob Electr M	6	18%	9%	83%	100%

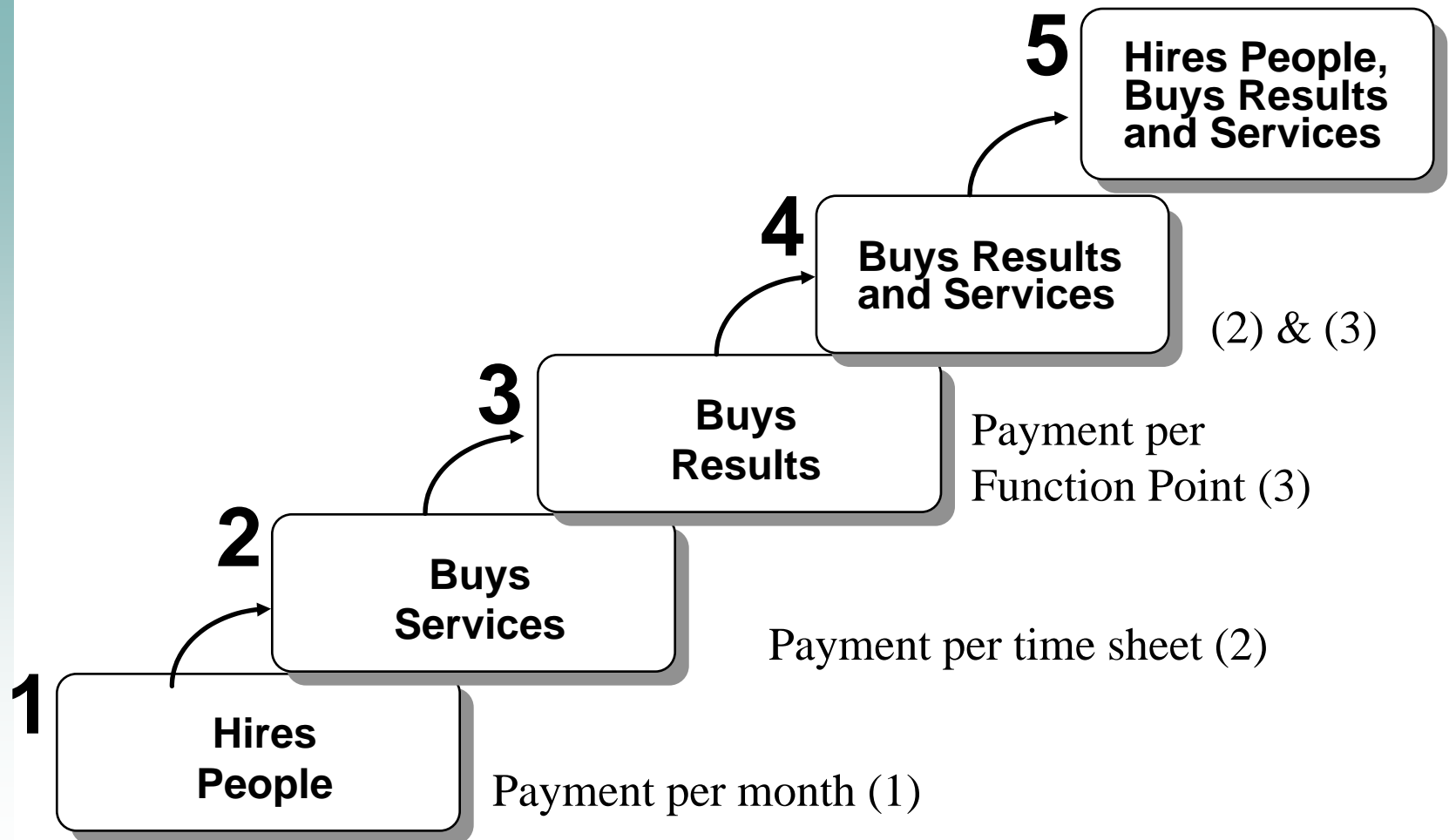


# *Function Points in Contracts*





# A Maturity Model





# The Productivity Approach

## What is Productivity?

- Effort to develop a Function Point - consider the development life cycle as a whole
  - **Will vary with project characteristics**
    - Project size
    - Team experience
    - Team capability
    - Platform difficulty
    - Personnel turnover
    - Application complexity
    - Etc.
- Examples: 4 Hours per Function Point (4 H/FP), 10 H/FP, 15 H/FP, 30 H/FP, etc.

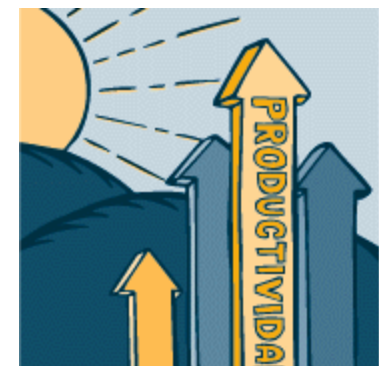


# The Productivity Approach

## Basic Equation

$$\begin{aligned} &\underline{\text{Development Price}} = \\ &\text{Function Points} \quad \times \\ &\text{Productivity} \quad \times \\ &\text{Average Unit Price of Work-Hour} \\ \\ &= \text{FP} \times \text{PROD} \times \text{UP} \end{aligned}$$

FP in Function Points,  
PROD in Hours/FP  
UP in \$/Hour





# The Productivity Approach

## Project Phases

- Effort may be broken down by project phase.
- Some will break down FP's by phase.
- Phase percentages should be derived from historical data.



# The Productivity Approach

## Some Productivity Data

Language Type	Projects	Median
2GL	17	17.4
3GL	1007	11.9
4GL	504	6.8
APG	89	7.2
	<b>1617</b>	

Source: ISBSG Version 8 - H/FP (adjusted)

### Some Brazilian Data (Hr / Adj FP)

2 Brazilian Banks (average)	20.27
2 Brazilian Service Organizations (average)	4.67

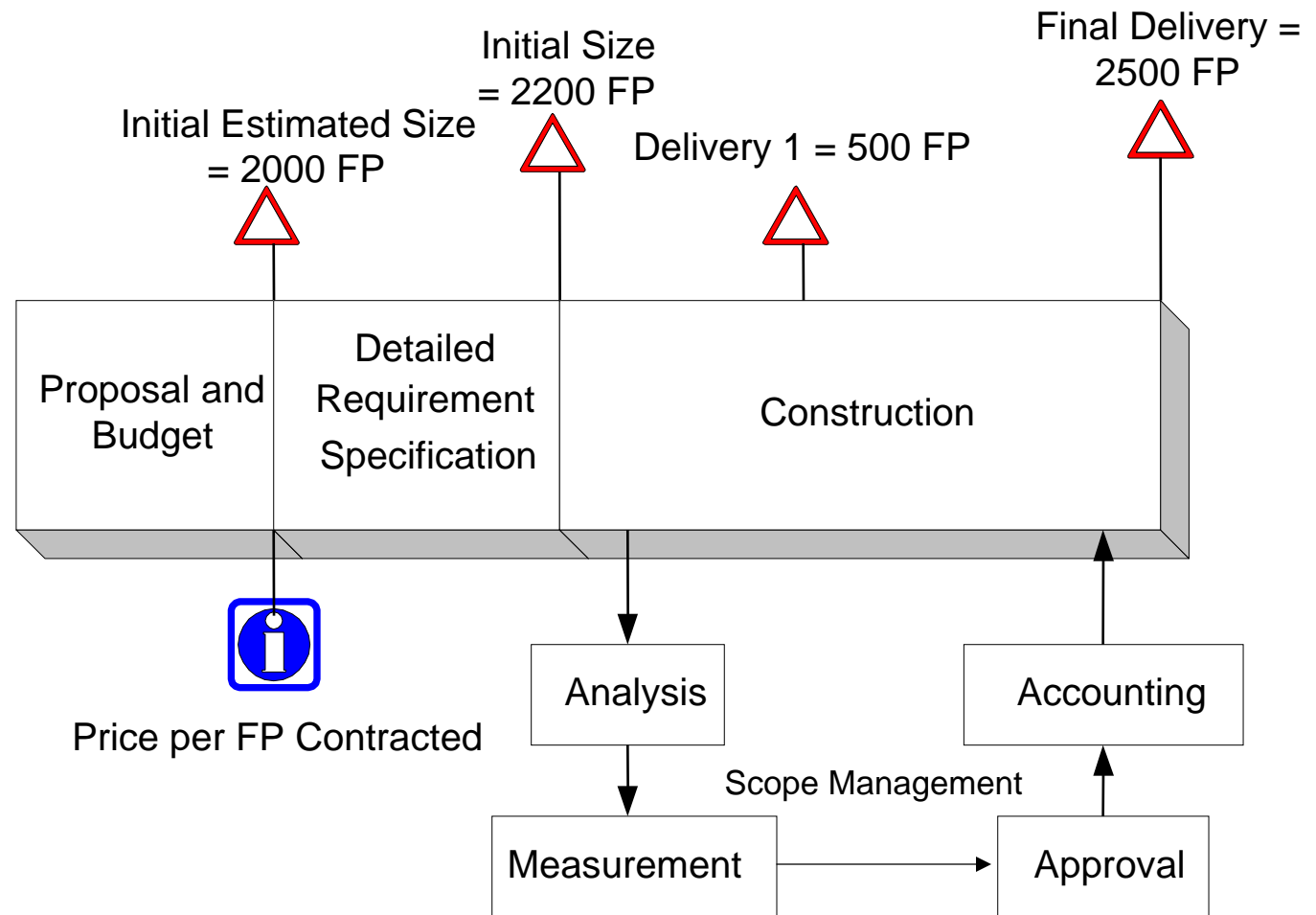


# The Price per FP Approach

- Price per Function Point
  - **Based on functionality requested and delivered to the client**
  - **Based on a measure of the accomplished results**
  - **Price per FP will vary with project characteristics that may impact productivity**
  - **Both parties should be open to contract changes based on measurements made along the contract**



# Scope Management



**Total Delivered = 2500 FP**

**Total Changes = 800 FP**



## Cases

- Telecommunications Company (Long Distance - Total assets US\$ 1.6 billion)
  - **Requirements analysts (developers) do all FP counting**
  - **“Metrics Office” - 3 people (1 CFPS)**
    - Tailor development methodology to support FPA
    - Train developers in FP counting
    - Validate FP counts done by developers
    - Referees FP discussion between client and suppliers
  - **1 year was required to make all changes and train approximately 70 requirements analysts**





## Cases

- Government Bank (over 3,000 branches - over US\$ 45 billion in assets)
  - **Developers do most FP counting**
  - **“Project Office” - approximately 15 people, 6 FP counters, 4 CFPS**
    - Tailor development methodology to support FPA
    - Train developers in FP counting
    - Validate FP counts done by developers
    - Referees FP discussion between client and suppliers
    - Do some counting
    - Project Office also does SEPG work
  - **Approximately 400 developers supported**



# Thank You!

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